AWARD/CONTRACT	1. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700)	RATING	PAGE OF PAGES 1 | 3

2. CONTRACT (Proc. Inst. Ident.) NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQUEST/PROJECT NO.
EP-C-17-031/68HERC20F0010	See Block 20C	See Schedule

5. ISSUED BY	CODE	6. ADMINISTERED BY (If other than Item 5)	CODE
CAD US Environmental Protection Agency 26 West Martin Luther King Drive Mail Code: W136 Cincinnati OH 45268-0001	CAD		

7. NAME AND ADDRESS OF CONTRACTOR (No., street, country, State and ZIP Code)	8. DELIVERY	9. DISCOUNT FOR PROMPT PAYMENT
TETRA TECH, INC. Attn: John Hochheimer 10306 EATON PL STE 340 FAIRFAX VA 22030	☐ FOB ORIGIN ☒ OTHER (See below)	

CODE 198549560	FACILITY CODE	10. SUBMIT INVOICES (4 copies unless otherwise specified) TO THE ADDRESS SHOWN IN	ITEM

11. SHIP TO/MARK FOR	CODE	12. PAYMENT WILL BE MADE BY	CODE
Office of Research and Development US Environmental Protection Agency 109 T.W. Alexander Drive Research Triangle Park NC 27711	ORD RTP	RTP Finance Center US Environmental Protection Agency RTP-Finance Center (AA216-01) 109 TW Alexander Drive www2.epa.gov/financial/contracts Durham NC 27711	RTP FMC

13. AUTHORITY FOR USING OTHER THAN FULL AND OPEN COMPETITION:	14. ACCOUNTING AND APPROPRIATION DATA
☐ 10 U.S.C. 2304 (c) ( ) ☒ 41 U.S.C. 3304 (a) ( )	See Schedule

15A. ITEM NO	15B. SUPPLIES/SERVICES	15C. QUANTITY	15D. UNIT	15E. UNIT PRICE	15F. AMOUNT
	Continued				
	15G. TOTAL AMOUNT OF CONTRACT				$199,888.14

16. TABLE OF CONTENTS

(X)	SEC.	DESCRIPTION	PAGE(S)	(X)	SEC.	DESCRIPTION	PAGE(S)
		PART I - THE SCHEDULE				PART II - CONTRACT CLAUSES	
	A	SOLICITATION/CONTRACT FORM			I	CONTRACT CLAUSES	
	B	SUPPLIES OR SERVICES AND PRICES/COSTS				PART III - LIST OF DOCUMENTS, EXHIBITS AND OTHER ATTACH.	
	C	DESCRIPTION/SPECS./WORK STATEMENT			J	LIST OF ATTACHMENTS	
	D	PACKAGING AND MARKING				PART IV - REPRESENTATIONS AND INSTRUCTIONS	
	E	INSPECTION AND ACCEPTANCE			K	REPRESENTATIONS, CERTIFICATIONS AND OTHER STATEMENTS OF OFFERORS	
	F	DELIVERIES OR PERFORMANCE					
	G	CONTRACT ADMINISTRATION DATA			L	INSTRS., CONDS., AND NOTICES TO OFFERORS	
	H	SPECIAL CONTRACT REQUIREMENTS			M	EVALUATION FACTORS FOR AWARD	

CONTRACTING OFFICER WILL COMPLETE ITEM 17 (SEALED-BID OR NEGOTIATED PROCUREMENT) OR 18 (SEALED-BID PROCUREMENT) AS APPLICABLE

17. ☒ CONTRACTOR' S NEGOTIATED AGREEMENT (*Contractor is required to sign this document and return* _____ *copies to issuing office.)* Contractor agrees to furnish and deliver all items or perform all the services set forth or otherwise identified above and on any continuation sheets for the consideration stated herein. The rights and obligations of the parties to this contract shall be subject to and governed by the following documents: (a) this award/contract, (b) the solicitation, if any, and (c) such provisions, representations, certifications, and specifications, as are attached or incorporated by reference herein. *(Attachments are listed herein.)*

18. ☐ SEALED-BID AWARD (*Contractor is not required to sign this document.*) Your bid on Solicitation Number 68HERC19R0062, including the additions or changes made by you which additions or changes are set forth in full above, is hereby accepted as to the items listed above and on any continuation sheets. This award consummates the contract which consists of the following documents: (a) the Government's solicitation and your bid, and (b) this award/contract. No further contractual document is necessary. (Block 18 should be checked only when awarding a sealed-bid contract.)

19A. NAME AND TITLE OF SIGNER (Type or print)	20A. NAME OF CONTRACTING OFFICER
	Andrea Dehne

19B. NAME OF CONTRACTOR	19C. DATE SIGNED	20B. UNITED STATES OF AMERICA	20C. DATE SIGNED
BY _____ *(Signature of person authorized to sign)*		BY Andrea C. Dehne ELECTRONIC SIGNATURE *(Signature of the Contracting Officer)*	10/10/2019

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	DUNS Number: 198549560 TOCOR: Caroline Ridley Max Expire Date: 10/08/2021 Delivery: 10/08/2021 Period of Performance: 10/10/2019 to 10/08/2021 Fully Funded Firm Fixed Price(FFP) Task Order:				
0001	Task Order Issuance Line Item: Technical Support for EPA/ORD Ecological Assessment Programs Requisition No: PR-ORD-19-00937, PR-ORD-19-02473 Accounting Info: 19-20-C-262W000-000FK7XR3-2532-26A5C-19262WC910-00 1 BFY: 19 EFY: 20 Fund: C Budget Org: 262W000 Program (PRC): 000FK7XR3 Budget (BOC): 2532 Cost: 26A5C DCN - Line ID: 19262WC910-001 Funding Flag: Partial Funded: $85,000.00 Accounting Info: 19-20-C-262W000-000FK8XPW-2532-26A5C-19262WC910-00 2 BFY: 19 EFY: 20 Fund: C Budget Org: 262W000 Program (PRC): 000FK8XPW Budget (BOC): 2532 Cost: 26A5C DCN - Line ID: 19262WC910-002 Funding Flag: Partial Funded: $65,000.00 Accounting Info: 19-20-C-262W000-000F84-2532-26A6A-19262WC928-001 BFY: 19 EFY: 20 Fund: C Budget Org: 262W000 Program (PRC): 000F84 Budget (BOC): 2532 Cost: 26A6A DCN - Line ID: 19262WC928-001 Funding Flag: Partial Funded: $49,888.14				199,888.14
	Delivery-Invoice Payment Schedule shall not exceed a frequency greater than once a month and 90% of the task order price. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, performance based payment invoicing amounts will not be submitted until the TOCOR provides deliverable approval. The TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove. TOCOR: Caroline Ridley/(919)541-5341/ridley.caroline@epa.gov ALTOCOR: Stephan Continued ...				

NAME OF OFFEROR OR CONTRACTOR

TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	LeDuc/(919)541-2183/leduc.stephen@epa.gov				

Performance Work Statement
EP-C-17-031
PR-ORD-19-00937
SOL 68HERC19R0062 Amend 2
TO 68HERC20F0010

I. Title: Nutrient dynamics and effects in freshwater systems

II. EAS Short Title: Nutrients in freshwater

III. Period of Performance: Date of TO award through 24 months following award

IV. Task Order COR:
Caroline Ridley, PhD
U.S. Environmental Protection Agency Office of Research and Development
National Center for Environmental Assessment (B243-01) 109 TW Alexander Dr
RTP, NC 27709
919-541-5341 (phone)
ridley.caroline@epa.gov

Alternate Task Order COR:
Stephen LeDuc, PhD
U.S. Environmental Protection Agency Office of Research and Development
National Center for Environmental Assessment (B243-01) 109 TW Alexander Dr
RTP, NC 27709
919-541-2183 (phone)
leduc.stephen@epa.gov

V. Introduction:

The EPA Office of Research and Development's (ORD) Exposure Analysis and Risk Characterization Group works to build the capacity of EPA program and regional offices, and other decision-makers to assess and respond to potential effects on environmental quality. Research and assessment activities broadly support EPA's mission and responsibilities.

Excess nutrients have been and continue to be important pollutants in freshwater systems. Understanding nutrient dynamics and the effects of nutrients on biological endpoints are both important for developing and implementing regulatory and non-regulatory programs that ensure the health of aquatic ecosystems. The published literature offers a rich source of information and data on which to base these programs. Unfortunately, individuals like state and local nutrient managers that are likely to benefit greatly from understanding the literature often don't have the time or the capability to access it in a comprehensive way. Assessment scientists at EPA access, organize, synthesize, interpret, and communicate evidence from the published literature so that managers can more easily apply this source of information in their work.

EPA Office of Water (OW), state nutrient managers, and local managers are the primary audiences for this effort. OW and state nutrient managers work together to develop numeric nutrient criteria that are protective of aquatic life in various types of water bodies (eg, small streams, large rivers, lakes, etc.) and other non-regulatory programs that help to limit the effects of nutrients in aquatic ecosystems. Local managers often work to comply with these programs to ensure their waterbodies support healthy biological communities.

This TO has several phases. The first phase involves an existing dataset developed through a systematic review of published literature. The dataset consists of quantitative relationships (also referred to effect sizes) between in-stream nitrogen and phosphorus (P) levels and biological responses (chlorophyll a, diatoms, macroinvertebrates) extracted from journal articles and reports. The dataset also captures a large amount of information about study design and environmental context that is important for interpreting those relationships. The work outlined in the TO consists of refining this dataset and initiating analysis for EPA Office of Water and state nutrient managers as they develop numeric nutrient criteria and other non-regulatory programs to limit effects of nutrients.

The second phase is a review of the published literature addressing P retention in lakes. When P enters a lake, it takes time for the particle of P to undergo internal cycling and eventually leave the system. Lakes differ in hydraulic retention times, resuspension rates, and other physical, chemical, and biological properties that can affect P retention time. Recovery from P enrichment can lag reduction in P inputs if P retention time in the lake is long. Information about this lag time can help lake managers develop plans and realistic expectations about rates of recovery from nutrient pollution.

The third phase is extraction of information from published literature about a set of relationships between agricultural sources of P and aquatic P levels (i.e., the relationship between tile drains and waterbody P, tillage and runoff P, and internal P and waterbody P). Understanding and assembling the evidence in the literature about each of these relationships will help managers identify the best options for achieving nutrient reductions in aquatic environments where agriculture is an important source of nutrient pollution.

VI. Specific Tasks and Deliverables:

Task 1. Establish communication with the TOCOR and develop a QAPP

A. Within 3 days of TO award, the Contractor shall schedule a kick-off call to take place within 30 days with the TOCOR and appropriate contractor staff to discuss the TO, clarify any initial questions about tasks and deliverables, and confirm the schedule.
B. All work conducted under this TO shall be performed pursuant to an EPA approved Quality Assurance Project Plan (QAPP) developed by the Contractor and approved by the TOCOR and QA manager. The QAPP outlines the approach and measures the Contractor shall implement to ensure a high standard of quality in the deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). The contractor shall not initiate tasks related to any items needing QA review until the TOCOR furnishes, in writing, a notice that the QAPP for the current period has been accepted by EPA.

The draft QAPP shall be delivered as a .docx file and the final QAPP shall be delivered as a .docx file and PDF file.

Deliverable 1.A.: Kick-off phone call. Due within 33 days after TO award.

Deliverable 1.B.1: A draft QAPP submitted to the TOCOR and QA Manager for review. Due 2 weeks after being issued the TO.

Deliverable 1.B.2: A final QAPP addressing TOCOR comments on the draft QAPP. Due 1 week after receiving comments on Deliverable 1.B.1.

Task 2. Data formatting, assignment, and analysis related to in-stream nutrient levels and biological responses.

This task applies to a dataset of relationships (also referred to effect sizes) between in-stream nutrient levels and biological responses (chlorophyll a, diatoms, macroinvertebrates) extracted from published literature (302 articles total). See Exhibit 1 as an illustrative example. The dataset also includes information about the environmental context in which the relationships were measured/estimated. The TOCOR will provide the dataset and, upon request, PDFs of any articles necessary to complete this task. PDFs of articles provided must not be distributed outside of this TO. The Contractor shall add information to this dataset and deliver it in a revised spreadsheet format. Additionally, the Contractor shall develop analyses and figures using the dataset.

Specifically, the Contractor shall:

A. Make the latitude/longitude values extracted from articles consistent across the dataset (e.g., removing text from latitude/longitude fields; converting degrees, minutes, seconds to decimal degrees). The Contractor shall spend time not to exceed 15 hours on this deliverable, noting any of the ~128 articles with lat/long information that could not be converted in the timeframe. After a subset (e.g., 15-20 articles) is completed, the Contractor shall update the TOCOR on progress, identify issues, and propose ways to address issues via a phone call.
B. For articles with sites in the conterminous U.S., assign Level III Ecoregion(s) (<u>not</u> nutrient ecoregion) to effect sizes. Assignments shall be recorded in the dataset as 0, 1 in separate columns for each Level III Ecoregion in the conterminous United States. The Contractor shall spend time not to exceed 8 hours on this deliverable, noting any of the ~39 articles representing 1066 effect sizes that could not be assigned in the timeframe.
C. For articles with sites in the conterminous U.S. that did not report latitude or longitude (~106 articles representing 4,413 effect sizes), assign Level III Ecoregion(s) covered by the sites in the article as a whole. This may involve utilizing other fields in the dataset (eg, State, Study design comments, General context comment) in combination with the article itself and GIS tools. If it appears that subsets of data that differ from the article as a whole in their geographic extent were used to calculate an effect size(s), the article shall be flagged with a brief note to describe why. If 120 minutes are spent on an article and Ecoregion assignments cannot be completed or no Level III Ecoregion can be assigned with a reasonable amount of confidence, the article shall be considered "assignment incomplete" and "cannot assign," respectively. Notes should be kept alongside each article or row in the dataset when Level III Ecoregion could not be completed or assigned, providing a brief summary of the reasons. After a subset (e.g., 15-20 articles) is completed, the Contractor shall update the TOCOR on progress, identify issues, and propose ways to address issues via a phone call.
D. The Contractor shall spend time not to exceed 150 hours to develop and execute code for statistical summaries and tests, meta-analyses, and figures pertaining to a version of the dataset provided by the TOCOR to answer the questions: *What is the response of chlorophyll*

a to *total nitrogen and total phosphorus concentrations in lotic ecosystems?* and *How are these relationships affected by other factors?.* The Contractor shall develop R code for up to 20 analyses through technical collaboration with the TOCOR that may include: meta-analysis of correlation coefficients, statistical summaries and tests to describe the shape, direction, strength, and variability of nutrient-chlorophyll relationships, and sensitivity analysis and meta-regression to evaluate potential effects of study quality and modifying factors (e.g., country, U.S. state, Level III Ecoregion, stream order, stream width, elevation) on nutrient-chlorophyll relationships. The Contractor shall also develop up to 5 figures based on these analyses that are of sufficient quality to be included in scientific presentations and publications and may include: scatterplots and regression analyses, meta-analysis forest plots using R packages metafor or similar, and histograms of relationships over ranges of nutrients or endpoints. The underlying R code for analyses and figures shall be provided to the TOCOR and shall be annotated with narrative descriptions of the purpose and results of the analyses.

The Contractor shall provide the deliverables 2.A-D as MS Excel or .csv files, updating the provided dataset with appropriate columns for Level III Ecoregion. A small example dataset has been attached for illustration purposes only (Attachment 1). The Contractor shall provide deliverables 2.E.1 and 2.E.2 in the format of text files and R script for the code and .jpeg or .png for figures.

Deliverable 2.A: Revised dataset including formatted latitude and longitude fields for articles (see Task 2.A). Due 2 weeks after delivery of dataset by TOCOR.

Deliverable 2.B: Deliverable 2.A updated to include Level III Ecoregion associations for articles with latitude/longitude values (see Task 2.B). Due 2 weeks after technical collaboration with TOCOR.

Deliverable 2.C: Spreadsheet of Level III Ecoregion associations for articles without latitude/longitude values (see Task 2.C). Due 6 weeks after technical collaboration with TOCOR.

Deliverable 2.D.1: Draft R code, analysis results, and figures. Due 2 months after delivery of final dataset and any example code by TOCOR.

Deliverable 2.D.2: Requested revisions to Deliverable 2.D.1. Due 2 weeks after technical collaboration with the TOCOR.

Task 3. Literature review and draft report on phosphorus (P) retention in lakes.

This task is a review of the literature on the "retention" of P in lakes. When P enters a lake, such as from fertilizer runoff or natural weathering, it takes time for the particle of P to undergo internal cycling and eventually leave the system. Lakes differ in hydraulic retention times, resuspension rates, and other physical, chemical, and biological properties that can affect P retention time. Recovery from P enrichment can lag reduction in P inputs if P retention time in the lake is long. Information about this lag time can help lake managers develop plans and realistic expectations about rates of recovery from nutrient pollution. This task will review the information available in the literature about P retention, P residence time or age, and recovery after reduction in P inputs in lakes. The TOCOR will provide methods for searching literature databases and screening the search results in

technical directives; the TOCOR will also provide reviews of the draft manuscript to complete this task.

The Contractor shall:

A. Compile an EndNote library of citations resulting from searching two literature databases (Web of Science and Google Scholar) using the search terms provided by the TOCOR. Example search terms may have this format: (*phosph* AND (lake OR reservoir) AND (((retention OR residence) AND time) OR age OR recover*)). For Web of Science, the number of citations retrieved will be no more than the first 10,000 citations sorted by relevance. If the number of citations is well above 10,000, the TOCOR may limit the search to a subset of studies (e.g., studies conducted in North America). For Google Scholar, the citations retrieved will be no more than the first 100 results. The Contractor shall reconcile duplicate citations in the EndNote library (**full search library**), to create a separate EndNote library (**final search library**) with no duplicate entries.

B. Screen the titles and abstracts in the final search library using inclusion/exclusion criteria provided by the TOCOR to create the next EndNote library (**screened library**). Any duplicate entries missed by the software in task 3.A should be reconciled as part of this task. Access to a screening tool software (such as SWIFT Active Screener) shall be provided by the TOCOR to facilitate the task. During the screening process, the Contractor shall answer general questions (provided by the TOCOR in the screening software) using information in the titles and abstracts to determine if the citation meets inclusion criteria. The Contractor shall screen citations until the screening software determines 95% relevant papers detected. The Contractor shall create a separate EndNote library (**relevant library**) of citations that meet inclusion criteria and ensure that tags from the screened library are retained in the relevant library. These citations will be called "relevant papers."

C. Screen a separate EndNote library of citation mapping results (**citation mapping library**). First, the TOCOR will use citations in the relevant library and up to 10 additional highly relevant papers (based on the TOCOR's personal knowledge) to conduct forward and backward citation mapping. The TOCOR will select citations ranked as among the top 10% or 500 most relevant by citation mapping, whichever is less, for inclusion in the citation mapping library. After the TOCOR delivers the citation mapping library to the Contractor, the Contractor shall screen and tag these citations in the same way as task 3.B and create a **screened citation mapping library**. The Contractor shall merge the screened citation mapping library with the relevant library created in task 3.B. The Contractor shall reconcile the duplicate citations between these two libraries to create a new library (**relevant + screened citation mapping library**) with no duplicate entries.

D. Create a database of evidence from reviewing the full text of each paper in the complete (relevant + screened citation mapping) EndNote library created in Task 3.C or a subset of up to 200 papers selected by the TOCOR from the relevant + screened citation mapping, whichever is less. If necessary, the TOCOR will provide pdfs of relevant papers that the Contractor is unable to freely access. PDFs must not be distributed outside of this TO. The Contractor shall not be required to review papers that neither the Contractor nor the TOCOR can access. The TOCOR shall set up questions in screening software to facilitate data extraction. The Contractor shall export the answers to these questions and format the data into an Excel spreadsheet. For each paper, the Contractor shall extract contextual information (e.g., lake location, size, surrounding land use), the factors used to estimate P retention (e.g., P load, lake depth, hydraulic retention time), and the values for P retention and hydraulic retention times. The Contractor shall spend time not to exceed 120 minutes per paper and note the papers that require more time for full text extraction. The Contractor

shall check-in with the TOCOR via a phone call after completion of 5 paper extractions to review the format and level of detail.

E. Provide a detailed report, including visuals, that summarize the searching and screening process, as well as major insights from the evidence database. The report should include a PRISMA flow diagram (http://prisma-statement.org/PRISMAStatement/FlowDiagram) of the searching and screening process. The report should include one or more heat maps of the final subset of relevant papers that shows the number of papers in specific bins of literature specified by the TOCOR. The Contractor shall work with the TOCOR to develop other visuals that help characterize the major insights for the literature review. Some example insights could include: many papers may mention that lake depth is an important factor for P retention or hydraulic retention has a strong correlation with P retention, but only for certain lake types.

The Contractor shall provide the deliverables A-C as EndNote libraries compatible with EndNote X7, deliverable D as an .xlsx file, and E.1 and E.2 as a .docx file.

Deliverable 3.A: EndNote full search library and final search library (see Task 3.A). Due 2 weeks after technical collaboration with TOCOR.

Deliverable 3.B: EndNote screened library and relevant library (see Task 3.B). Due 2 months after technical collaboration with TOCOR.

Deliverable 3.C: EndNote screened citation mapping library, and relevant + screened citation mapping library (see Task 3.C). Due 2 months after technical collaboration with TOCOR.

Deliverable 3.D: Evidence database (see Task 3.D). Due 4 months after technical collaboration with TOCOR.

Deliverable 3.E.1: Draft report (see Task 3.E). Due 2 months after technical collaboration with TOCOR.

Deliverable 3.E.1: Final report. Due 1 month after technical collaboration with TOCOR.

Task 4. Literature extraction related to agricultural causes of aquatic phosphorus (P) levels.

This task involves the extraction of up to 30 fields of information from papers that explicitly evaluate one or more relationship(s) between agricultural P sources and aquatic P concentrations. See Exhibit 2 as an illustrative example. The TOCOR will provide pdfs for the papers to be extracted (along with the specified relationship each paper is relevant to); a spreadsheet for data entry of extracted information; a guide to what each extracted field of information means; and an example pdf that is highlighted to show where extracted information is found in the paper. PDFs must not be distributed beyond this TO.

The Contractor shall:

A. Review the extraction spreadsheet, guide, and example pdf and schedule a call to discuss any general questions about methods. For up to 200 papers total, extract and enter specified fields of information for one of the three relevant relationships (i.e., tile drains to waterbody P, tillage to runoff P, or internal P to waterbody P) into the extraction spreadsheet. After a

subset (e.g., 5-10 articles) is completed, the Contractor shall schedule another call to update the TOCOR on progress, identify specific extraction issues, and propose ways to address issues. The Contractor shall spend time not to exceed 300 hours on this task.

The Contractor shall provide the deliverable 4.A as a .xlsx file.

Deliverable 4.A: Completed extraction spreadsheet that contains all extracted information for the up to 200 papers. Due 3 months after technical collaboration with TOCOR.

Schedule of Milestones and Deliverables: Task No.	DELIVERABLE	Schedule
1	Deliverable 1.A. Kick-off phone call Deliverable 1.B.1. Draft QAPP Deliverable 1.B.2. Final QAPP	-Due within 33 days after award -Due 2 weeks after award -Due 1 week after comments on 1.B.1.
2	Deliverable 2.A. Revised dataset including formatted latitude and longitude fields Deliverable 2.B: Deliverable 2.A updated to include Level III Ecoregion assigned to articles with latitude/longitude Deliverable 2.C: Deliverable 2.B updated to include Level III Ecoregion assigned to articles without latitude/longitude Deliverable 2.D.1: Draft R code, analysis results, and figures Deliverable 2.D.2: Requested revisions to Deliverable 2.D.1	- Due 2 weeks after delivery of dataset by TOCOR -Due 2 weeks after technical collaboration with TOCOR -Due 6 weeks after technical collaboration with TOCOR - Due 2 months after delivery of dataset by TOCOR -Due 2 weeks after technical collaboration with the TOCOR
3	Deliverable 3.A: EndNote full search library and final search library. Deliverable 3.B: EndNote screened library and relevant library. Deliverable 3.C: EndNote screened citation mapping library, and relevant + screened citation mapping library. Deliverable 3.D: Evidence database. Deliverable 3.E.1: Draft report. Deliverable 3.E.2: Final report.	- Due 2 weeks after technical collaboration with TOCOR -Due 2 months after technical collaboration with TOCOR -Due 2 months after technical collaboration with TOCOR -Check-in after 1 week and due 4 months after technical collaboration with TOCOR -Due 2 months after technical collaboration with TOCOR

		-Due 1 month after technical collaboration with TOCOR
4	Deliverable 4.A: Completed extraction spreadsheet that contains extracted information for up to 200 papers.	- Due 3 months after technical collaboration with TOCOR.

VII. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality, similar to those in presentations developed for national scientific meetings and should be formatted as jpeg or png files. Citation library deliverables shall be compatible with EndNote X7. Spreadsheet and report deliverables shall be compatible with Microsoft Office 365. Text files related to R code shall be compatible with R 3.5 and R Studio 1.1.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. *(If applicable)*
P00001	See Block 16C	PR-ORD-20-01654	

6. ISSUED BY	CODE	7. ADMINISTERED BY *(If other than Item 6)*	CODE
CAD	CAD		

CAD
US Environmental Protection Agency
26 West Martin Luther King Drive
Mail Code: W136
Cincinnati OH 45268-0001

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*

TETRA TECH, INC.
Attn: John Hochheimer
10306 EATON PL STE 340
FAIRFAX VA 22030

CODE 198549560 FACILITY CODE

(x) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED *(SEE ITEM 11)*

x 10A. MODIFICATION OF CONTRACT/ORDER NO.
EP-C-17-031
68HERC20F0010

10B. DATED *(SEE ITEM 13)*
10/10/2019

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended. ☐ is not extended.
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended , by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted ; or (c) By separate letter or electronic communication which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted , such change may be made by letter or electronic communication, provided each letter or electronic communication makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*
See Schedule

Net Increase: $9,600.00

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	
	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation data, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	D. OTHER *(Specify type of modification and authority)* SUPPLEMENTAL AGREEMENT FOR WORK WITHIN SCOPE , NO POP CHANGE

E. IMPORTANT: Contractor ☐ is not ☒ is required to sign this document and return 1 copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

DUNS Number: 198549560
TOCOR: Caroline Ridley Max Expire Date: 10/08/2021
LIST OF CHANGES:
Reason for Modification: Supplemental Agreement for work within scope, no PoP change (see attached revised PWS).
Total Amount for this Modification: $9,600.00
New Total Amount for this Version: $209,488.14
New Total Amount for this Award: $209,488.14
Obligated Amount for this Modification: $9,600.00
New Total Obligated Amount for this Award: $209,488.14

Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9 A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER *(Type or print)*		16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*	
		Andrea Dehne	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)		Andrea C. Dehne ELECTRONIC SIGNATURE *(Signature of Contracting Officer)*	07/30/2020

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	CHANGES FOR LINE ITEM NUMBER: 1 Total Amount changed from $199,888.14 to $209,488.14 Obligated Amount for this Modification: $9,600.00 CHANGES FOR DELIVERY LOCATION: ORD RTP Amount changed from $199,888.14 to $209,488.14 NEW ACCOUNTING CODE ADDED: Account code: 20-21-C-26D2000-000FK7XR4-2532-26A5C-2026D2C018-00 1 Beginning FiscalYear 20 Ending Fiscal Year 21 Fund (Appropriation) C Budget Organization 26D2000 Program (PRC) 000FK7XR4 Budget (BOC) 2532 Job # (Site/Project) Cost Organization 26A5C DCN-LineID 2026D2C018-001 Amount: $9,600.00 Subject To Funding: N Payment: RTP Finance Center US Environmental Protection Agency RTP-Finance Center (AA216-01) 109 TW Alexander Drive www2.epa.gov/financial/contracts Durham NC 27711 Period of Performance: 10/10/2019 to 10/08/2021 Delivery-Invoice Payment Schedule shall not exceed a frequency greater than once a month and 90% of the task order price. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, performance based payment invoicing amounts will not be submitted until the TOCOR provides deliverable approval. The TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove. TOCOR: Caroline Ridley/(919)541-5341/ridley.caroline@epa.gov ALTOCOR: Stephan LeDuc/(919)541-2183/leduc.stephen@epa.gov				

Performance Work Statement
EP-C-17-031
PR-ORD-19-00937/PR-ORD-20-01654
SOL 68HERC19R0062 Amend 2
TO #: 68HERC20F0010

Amendment 1

I. Title: Nutrient dynamics and effects in freshwater systems

II. EAS Short Title: Nutrients in freshwater

III. Period of Performance: Date of TO award through 24 months following award

IV. Task Order COR:
Caroline Ridley, PhD
U.S. Environmental Protection Agency Office of Research and Development
National Center for Environmental Assessment (B243-01) 109 TW Alexander Dr
RTP, NC 27709
919-541-5341 (phone)
ridley.caroline@epa.gov

Alternate Task Order COR:
Stephen LeDuc, PhD
U.S. Environmental Protection Agency Office of Research and Development
National Center for Environmental Assessment (B243-01) 109 TW Alexander Dr
RTP, NC 27709
919-541-2183 (phone)
leduc.stephen@epa.gov

V. Introduction:

The EPA Office of Research and Development's (ORD) Exposure Analysis and Risk Characterization Group works to build the capacity of EPA program and regional offices, and other decision-makers to assess and respond to potential effects on environmental quality. Research and assessment activities broadly support EPA's mission and responsibilities.

Excess nutrients have been and continue to be important pollutants in freshwater systems. Understanding nutrient dynamics and the effects of nutrients on biological endpoints are both important for developing and implementing regulatory and non-regulatory programs that ensure the health of aquatic ecosystems. The published literature offers a rich source of information and data on which to base these programs. Unfortunately, individuals like state and local nutrient managers that are likely to benefit greatly from understanding the literature often don't have the time or the capability to access it in a comprehensive way. Assessment scientists at EPA access, organize, synthesize, interpret, and communicate evidence from the published literature so that managers can more easily apply this source of information in their work.

EPA Office of Water (OW), state nutrient managers, and local managers are the primary audiences for this effort. OW and state nutrient managers work together to develop numeric nutrient criteria that are

protective of aquatic life in various types of water bodies (eg, small streams, large rivers, lakes, etc.) and other non-regulatory programs that help to limit the effects of nutrients in aquatic ecosystems. Local managers often work to comply with these programs to ensure their waterbodies support healthy biological communities.

This TO has several phases. The first phase involves an existing dataset developed through a systematic review of published literature. The dataset consists of quantitative relationships (also referred to effect sizes) between in-stream nitrogen and phosphorus (P) levels and biological responses (chlorophyll a, diatoms, macroinvertebrates) extracted from journal articles and reports. The dataset also captures a large amount of information about study design and environmental context that is important for interpreting those relationships. The work outlined in the TO consists of refining this dataset and initiating analysis for EPA Office of Water and state nutrient managers as they develop numeric nutrient criteria and other non-regulatory programs to limit effects of nutrients.

The second phase is a review of the published literature addressing P retention in lakes. When P enters a lake, it takes time for the particle of P to undergo internal cycling and eventually leave the system. Lakes differ in hydraulic retention times, resuspension rates, and other physical, chemical, and biological properties that can affect P retention time. Recovery from P enrichment can lag reduction in P inputs if P retention time in the lake is long. Information about this lag time can help lake managers develop plans and realistic expectations about rates of recovery from nutrient pollution.

The third phase is extraction of information from published literature about a set of relationships between agricultural sources of P and aquatic P levels (i.e., the relationship between tile drains and waterbody P, tillage and runoff P, and internal P and waterbody P). Understanding and assembling the evidence in the literature about each of these relationships will help managers identify the best options for achieving nutrient reductions in aquatic environments where agriculture is an important source of nutrient pollution.

VI. Specific Tasks and Deliverables:

Task 1. Establish communication with the TOCOR and develop a QAPP

A. Within 3 days of TO award, the Contractor shall schedule a kick-off call to take place within 30 days with the TOCOR and appropriate contractor staff to discuss the TO, clarify any initial questions about tasks and deliverables, and confirm the schedule.
B. All work conducted under this TO shall be performed pursuant to an EPA approved Quality Assurance Project Plan (QAPP) developed by the Contractor and approved by the TOCOR and QA manager. The QAPP outlines the approach and measures the Contractor shall implement to ensure a high standard of quality in the deliverables. The QAPP shall be in conformance with EPA's *Requirements for Quality Assurance Project Plans* (EPA QA/R-5). The contractor shall not initiate tasks related to any items needing QA review until the TOCOR furnishes, in writing, a notice that the QAPP for the current period has been accepted by EPA.

The draft QAPP shall be delivered as a .docx file and the final QAPP shall be delivered as a .docx file and PDF file.

Deliverable 1.A.: Kick-off phone call. Due within 33 days after TO award.

Deliverable 1.B.1: A draft QAPP submitted to the TOCOR and QA Manager for review. Due 2 weeks after being issued the TO.

Deliverable 1.B.2: A final QAPP addressing TOCOR comments on the draft QAPP. Due 1 week after receiving comments on Deliverable 1.B.1.

Task 2. Data formatting, assignment, and analysis related to in-stream nutrient levels and biological responses.

This task applies to a dataset of relationships (also referred to effect sizes) between in-stream nutrient levels and biological responses (chlorophyll a, diatoms, macroinvertebrates) extracted from published literature (302 articles total). See Exhibit 1 as an illustrative example. The dataset also includes information about the environmental context in which the relationships were measured/estimated. The TOCOR will provide the dataset and, upon request, PDFs of any articles necessary to complete this task. PDFs of articles provided must not be distributed outside of this TO. The Contractor shall add information to this dataset and deliver it in a revised spreadsheet format. Additionally, the Contractor shall develop analyses and figures using the dataset.

Specifically, the Contractor shall:

A. Make the latitude/longitude values extracted from articles consistent across the dataset (e.g., removing text from latitude/longitude fields; converting degrees, minutes, seconds to decimal degrees). The Contractor shall spend time not to exceed 15 hours on this deliverable, noting any of the ~128 articles with lat/long information that could not be converted in the timeframe. After a subset (e.g., 15-20 articles) is completed, the Contractor shall update the TOCOR on progress, identify issues, and propose ways to address issues via a phone call.
B. For articles with sites in the conterminous U.S., assign Level III Ecoregion(s) (<u>not</u> nutrient ecoregion) to effect sizes. Assignments shall be recorded in the dataset as 0, 1 in separate columns for each Level III Ecoregion in the conterminous United States. The Contractor shall spend time not to exceed 8 hours on this deliverable, noting any of the ~39 articles representing 1066 effect sizes that could not be assigned in the timeframe.
C. For articles with sites in the conterminous U.S. that did not report latitude or longitude (~106 articles representing 4,413 effect sizes), assign Level III Ecoregion(s) covered by the sites in the article as a whole. This may involve utilizing other fields in the dataset (eg, State, Study design comments, General context comment) in combination with the article itself and GIS tools. If it appears that subsets of data that differ from the article as a whole in their geographic extent were used to calculate an effect size(s), the article shall be flagged with a brief note to describe why. If 120 minutes are spent on an article and Ecoregion assignments cannot be completed or no Level III Ecoregion can be assigned with a reasonable amount of confidence, the article shall be considered "assignment incomplete" and "cannot assign," respectively. Notes should be kept alongside each article or row in the dataset when Level III Ecoregion could not be completed or assigned, providing a brief summary of the reasons. After a subset (e.g., 15-20 articles) is completed, the Contractor shall update the TOCOR on progress, identify issues, and propose ways to address issues via a phone call.
D. The Contractor shall spend time not to exceed 150 hours to develop and execute code for statistical summaries and tests, meta-analyses, and figures pertaining to a version of the dataset provided by the TOCOR to answer the questions: *What is the response of chlorophyll a to total nitrogen and total phosphorus concentrations in lotic ecosystems?* and *How are these relationships affected by other factors?.* The Contractor shall develop R code for up to 20 analyses through technical collaboration with the TOCOR that may include: meta-analysis of correlation coefficients, statistical summaries and tests to describe the shape, direction, strength, and variability of nutrient-chlorophyll relationships, and sensitivity analysis and meta-regression to evaluate potential effects of study quality and modifying factors (e.g.,

country, U.S. state, Level III Ecoregion, stream order, stream width, elevation) on nutrient-chlorophyll relationships. The Contractor shall also develop up to 5 figures based on these analyses that are of sufficient quality to be included in scientific presentations and publications and may include: scatterplots and regression analyses, meta-analysis forest plots using R packages metafor or similar, and histograms of relationships over ranges of nutrients or endpoints. The underlying R code for analyses and figures shall be provided to the TOCOR and shall be annotated with narrative descriptions of the purpose and results of the analyses.

The Contractor shall provide the deliverables 2.A-D as MS Excel or .csv files, updating the provided dataset with appropriate columns for Level III Ecoregion. A small example dataset has been attached for illustration purposes only (Attachment 1). The Contractor shall provide deliverables 2.E.1 and 2.E.2 in the format of text files and R script for the code and .jpeg or .png for figures.

Deliverable 2.A: Revised dataset including formatted latitude and longitude fields for articles (see Task 2.A). Due 2 weeks after delivery of dataset by TOCOR.

Deliverable 2.B: Deliverable 2.A updated to include Level III Ecoregion associations for articles with latitude/longitude values (see Task 2.B). Due 2 weeks after technical collaboration with TOCOR.

Deliverable 2.C: Spreadsheet of Level III Ecoregion associations for articles without latitude/longitude values (see Task 2.C). Due 6 weeks after technical collaboration with TOCOR.

Deliverable 2.D.1: Draft R code, analysis results, and figures. Due 2 months after delivery of final dataset and any example code by TOCOR.

Deliverable 2.D.2: Requested revisions to Deliverable 2.D.1. Due 2 weeks after technical collaboration with the TOCOR.

Task 3. Literature review and draft report on phosphorus (P) retention in lakes.

This task is a review of the literature on the "retention" of P in lakes. When P enters a lake, such as from fertilizer runoff or natural weathering, it takes time for the particle of P to undergo internal cycling and eventually leave the system. Lakes differ in hydraulic retention times, resuspension rates, and other physical, chemical, and biological properties that can affect P retention time. Recovery from P enrichment can lag reduction in P inputs if P retention time in the lake is long. Information about this lag time can help lake managers develop plans and realistic expectations about rates of recovery from nutrient pollution. This task will review the information available in the literature about P retention, P residence time or age, and recovery after reduction in P inputs in lakes. The TOCOR will provide methods for searching literature databases and screening the search results in technical directives; the TOCOR will also provide reviews of the draft manuscript to complete this task.

The Contractor shall:

A. Compile an EndNote library of citations resulting from searching two literature databases (Web of Science and Google Scholar) using the search terms provided by the TOCOR. Example search terms may have this format: (*phosph* AND (lake OR reservoir) AND (((retention OR residence) AND time) OR age OR recover*)). For Web of Science, the number of citations retrieved will be no more than the first 10,000 citations sorted by relevance. If

the number of citations is well above 10,000, the TOCOR may limit the search to a subset of studies (e.g., studies conducted in North America). For Google Scholar, the citations retrieved will be no more than the first 100 results. The Contractor shall reconcile duplicate citations in the EndNote library (**full search library**), to create a separate EndNote library (**final search library**) with no duplicate entries.

B. Screen the titles and abstracts in the final search library using inclusion/exclusion criteria provided by the TOCOR to create the next EndNote library (**screened library**). Any duplicate entries missed by the software in task 3.A should be reconciled as part of this task. Access to a screening tool software (such as SWIFT Active Screener) shall be provided by the TOCOR to facilitate the task. During the screening process, the Contractor shall answer general questions (provided by the TOCOR in the screening software) using information in the titles and abstracts to determine if the citation meets inclusion criteria. The Contractor shall screen citations until the screening software determines 95% relevant papers detected. The Contractor shall create a separate EndNote library (**relevant library**) of citations that meet inclusion criteria and ensure that tags from the screened library are retained in the relevant library. These citations will be called "relevant papers."
C. Screen a separate EndNote library of citation mapping results (**citation mapping library**). First, the TOCOR will use citations in the relevant library and up to 10 additional highly relevant papers (based on the TOCOR's personal knowledge) to conduct forward and backward citation mapping. The TOCOR will select citations ranked as among the top 10% or 500 most relevant by citation mapping, whichever is less, for inclusion in the citation mapping library. After the TOCOR delivers the citation mapping library to the Contractor, the Contractor shall screen and tag these citations in the same way as task 3.B and create a **screened citation mapping library**. The Contractor shall merge the screened citation mapping library with the relevant library created in task 3.B. The Contractor shall reconcile the duplicate citations between these two libraries to create a new library (**relevant + screened citation mapping library**) with no duplicate entries.
D. Create a database of evidence from reviewing the full text of each paper in the complete (relevant + screened citation mapping) EndNote library created in Task 3.C or a subset of up to ~~200~~ 240 papers selected by the TOCOR from the relevant + screened citation mapping, whichever is less. If necessary, the TOCOR will provide pdfs of relevant papers that the Contractor is unable to freely access. PDFs must not be distributed outside of this TO. The Contractor shall not be required to review papers that neither the Contractor nor the TOCOR can access. The TOCOR shall set up questions in screening software to facilitate data extraction. The Contractor shall export the answers to these questions and format the data into an Excel spreadsheet. For each paper, the Contractor shall extract contextual information (e.g., lake location, size, surrounding land use), the factors used to estimate P retention (e.g., P load, lake depth, hydraulic retention time), and the values for P retention and hydraulic retention times. The Contractor shall spend time not to exceed 120 minutes per paper and note the papers that require more time for full text extraction. The Contractor shall check-in with the TOCOR via a phone call after completion of 5 paper extractions to review the format and level of detail.
E. Provide a detailed report, including visuals, that summarize the searching and screening process, as well as major insights from the evidence database. The report should include a PRISMA flow diagram (http://prisma-statement.org/PRISMAStatement/FlowDiagram) of the searching and screening process. The report should include one or more heat maps of the final subset of relevant papers that shows the number of papers in specific bins of literature specified by the TOCOR. The Contractor shall work with the TOCOR to develop other visuals that help characterize the major insights for the literature review. Some example insights could include: many papers may mention that lake depth is an important factor for P

retention or hydraulic retention has a strong correlation with P retention, but only for certain lake types.

The Contractor shall provide the deliverables A-C as EndNote libraries compatible with EndNote X7, deliverable D as an .xlsx file, and E.1 and E.2 as a .docx file.

Deliverable 3.A: EndNote full search library and final search library (see Task 3.A). Due 2 weeks after technical collaboration with TOCOR.

Deliverable 3.B: EndNote screened library and relevant library (see Task 3.B). Due 2 months after technical collaboration with TOCOR.

Deliverable 3.C: EndNote screened citation mapping library, and relevant + screened citation mapping library (see Task 3.C). Due 2 months after technical collaboration with TOCOR.

Deliverable 3.D: Evidence database (see Task 3.D). Due ~~4~~ 5 months after technical collaboration with TOCOR.

Deliverable 3.E.1: Draft report (see Task 3.E). Due 2 months after technical collaboration with TOCOR.

Deliverable 3.E.1: Final report. Due 1 month after technical collaboration with TOCOR.

Task 4. Literature extraction related to agricultural causes of aquatic phosphorus (P) levels.

This task involves the extraction of up to 30 fields of information from papers that explicitly evaluate one or more relationship(s) between agricultural P sources and aquatic P concentrations. See Exhibit 2 as an illustrative example. The TOCOR will provide pdfs for the papers to be extracted (along with the specified relationship each paper is relevant to); a spreadsheet for data entry of extracted information; a guide to what each extracted field of information means; and an example pdf that is highlighted to show where extracted information is found in the paper. PDFs must not be distributed beyond this TO.

The Contractor shall:

A. Review the extraction spreadsheet, guide, and example pdf and schedule a call to discuss any general questions about methods. For up to 200 papers total, extract and enter specified fields of information for one of the three relevant relationships (i.e., tile drains to waterbody P, tillage to runoff P, or internal P to waterbody P) into the extraction spreadsheet. After a subset (e.g., 5-10 articles) is completed, the Contractor shall schedule another call to update the TOCOR on progress, identify specific extraction issues, and propose ways to address issues. The Contractor shall spend time not to exceed 300 hours on this task.

The Contractor shall provide the deliverable 4.A as a .xlsx file.

Deliverable 4.A: Completed extraction spreadsheet that contains all extracted information for the up to 200 papers. Due 3 months after technical collaboration with TOCOR.

Schedule of Milestones and Deliverables: Task No.	DELIVERABLE	Schedule
1	Deliverable 1.A. Kick-off phone call Deliverable 1.B.1. Draft QAPP Deliverable 1.B.2. Final QAPP	-Due within 33 days after award -Due 2 weeks after award -Due 1 week after comments on 1.B.1.
2	Deliverable 2.A. Revised dataset including formatted latitude and longitude fields Deliverable 2.B: Deliverable 2.A updated to include Level III Ecoregion assigned to articles with latitude/longitude Deliverable 2.C: Deliverable 2.B updated to include Level III Ecoregion assigned to articles without latitude/longitude Deliverable 2.D.1: Draft R code, analysis results, and figures Deliverable 2.D.2: Requested revisions to Deliverable 2.D.1	- Due 2 weeks after delivery of dataset by TOCOR -Due 2 weeks after technical collaboration with TOCOR -Due 6 weeks after technical collaboration with TOCOR - Due 2 months after delivery of dataset by TOCOR -Due 2 weeks after technical collaboration with the TOCOR
3	Deliverable 3.A: EndNote full search library and final search library. Deliverable 3.B: EndNote screened library and relevant library. Deliverable 3.C: EndNote screened citation mapping library, and relevant + screened citation mapping library. Deliverable 3.D: Evidence database. Deliverable 3.E.1: Draft report. Deliverable 3.E.2: Final report.	- Due 2 weeks after technical collaboration with TOCOR -Due 2 months after technical collaboration with TOCOR -Due 2 months after technical collaboration with TOCOR -Check-in after 1 week and due ~~4~~ 5 months after technical collaboration with TOCOR -Due 2 months after technical collaboration with TOCOR -Due 1 month after technical collaboration with TOCOR

4	Deliverable 4.A: Completed extraction spreadsheet that contains extracted information for up to 200 papers.	- Due 3 months after technical collaboration with TOCOR.

VII. Acceptance Criteria:

The Contractor shall prepare high quality deliverables. Deliverables shall be edited for grammar, spelling, and logic flow. The technical information shall be reasonably complete and presented in a logical, readable manner. Figures submitted shall be of high quality, similar to those in presentations developed for national scientific meetings and should be formatted as jpeg or png files. Citation library deliverables shall be compatible with EndNote X7. Spreadsheet and report deliverables shall be compatible with Microsoft Office 365. Text files related to R code shall be compatible with R 3.5 and R Studio 1.1.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. *(If applicable)*
P00002	See Block 16C		

6. ISSUED BY CODE CAD

CAD
US Environmental Protection Agency
26 West Martin Luther King Drive
Mail Code: W136
Cincinnati OH 45268-0001

7. ADMINISTERED BY *(If other than Item 6)* CODE

8. NAME AND ADDRESS OF CONTRACTOR *(No., street, county, State and ZIP Code)*

TETRA TECH, INC.
Attn: John Hochheimer
10306 EATON PL STE 340
FAIRFAX VA 22030

CODE 198549560 FACILITY CODE

(x) 9A. AMENDMENT OF SOLICITATION NO.

9B. DATED *(SEE ITEM 11)*

x 10A. MODIFICATION OF CONTRACT/ORDER NO.
EP-C-17-031
68HERC20F0010

10B. DATED *(SEE ITEM 13)*
10/10/2019

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended. ☐ is not extended.
Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended , by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted ; or (c) By separate letter or electronic communication which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted , such change may be made by letter or electronic communication, provided each letter or electronic communication makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*
See Schedule

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	
	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
X	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation data, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER *(Specify type of modification and authority)*

E. IMPORTANT: Contractor ☒ is not ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

DUNS Number: 198549560
TOCOR: Caroline Ridley Max Expire Date: 10/08/2021
The purpose of this modification is to incorporate the attached EPA blanket administrative modification signed by Raoul Scott on July 30, 2020. All other terms and conditions remain unchanged.
Payment:
Period of Performance: 10/10/2019 to 10/08/2021
Delivery-Invoice Payment Schedule shall not exceed a frequency greater than once a month and 90% of the task order price. Acceptance for invoicing is based on deliverable approval by the TOCOR. For efficient processing IAW FAR clause 52.232-32, performance based payment invoicing amounts will not be submitted until the TOCOR provides deliverable approval. The
Continued ...

Except as provided herein, all terms and conditions of the document referenced in Item 9 A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER *(Type or print)*		16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*	
		Andrea Dehne	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)		ELECTRONIC SIGNATURE *(Signature of Contracting Officer)*	10/09/2020

NAME OF OFFEROR OR CONTRACTOR
TETRA TECH, INC.

ITEM NO. (A)	SUPPLIES/SERVICES (B)	QUANTITY (C)	UNIT (D)	UNIT PRICE (E)	AMOUNT (F)
	TOCOR will notify Tetra Tech within 14 days of submission of a deliverable of EPAs intention to approve or disapprove. TOCOR: Caroline Ridley/(919)541-5341/ridley.caroline@epa.gov ALTOCOR: Stephan LeDuc/(919)541-2183/leduc.stephen@epa.gov				

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES

2. AMENDMENT/MODIFICATION NUMBER	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQUISITION NUMBER	5. PROJECT NUMBER *(If applicable)*
	08/13/2020		

6. ISSUED BY	CODE	7. ADMINISTERED BY *(If other than Item 6)*	CODE
Raoul D. Scott, Director OMS/ARM/OAS/Policy, Training and Oversight Division US Environmental Protection Agency, Mail Code 3802R 1200 Pennsylvania Avenue, NW Washington, DC 20004			

8. NAME AND ADDRESS OF CONTRACTOR *(Number, street, county, State and ZIP Code)*	(X)	9A. AMENDMENT OF SOLICITATION NUMBER
To All EPA Contractors	☐	9B. DATED *(SEE ITEM 11)*
	☒	10A. MODIFICATION OF CONTRACT/ORDER NUMBER To all EPA Contracts and Orders
		10B. DATED *(SEE ITEM 13)*
CODE / FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

☐ The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers ☐ is extended. ☐ is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or electronic communication which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by letter or electronic communication, provided each letter or electronic communication makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA *(If required)*

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NUMBER AS DESCRIBED IN ITEM 14.

CHECK ONE	
☐	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: *(Specify authority)* THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NUMBER IN ITEM 10A.
☒	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES *(such as changes in paying office, appropriation data, etc.)* SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
☐	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
☐	D. OTHER *(Specify type of modification and authority)*

E. IMPORTANT: Contractor ☒ is not ☐ is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION *(Organized by UCF section headings, including solicitation/contract subject matter where feasible.)*

This contract/order is being modified in accordance with the applicability instructions in interim FAR Case 2019-009, and FAR 4.2105, requiring contracting officers to include FAR clause 52.204-25, Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment.

See attached for the full text version of FAR 52.204-25. Contractor Acknowledgment of receipt required.

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER *(Type or print)*		16A. NAME AND TITLE OF CONTRACTING OFFICER *(Type or print)*	
		Raoul D. Scott, Director Policy, Training and Oversight Division	
15B. CONTRACTOR/OFFEROR	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA	16C. DATE SIGNED
(Signature of person authorized to sign)		RAOUL SCOTT Digitally signed by RAOUL SCOTT Date: 2020.07.30 11:40:17 -04'00' *(Signature of Contracting Officer)*	

Previous edition unusable

STANDARD FORM 30 (REV. 11/2016)
Prescribed by GSA FAR (48 CFR) 53.243

52.204-25 Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment.

As prescribed in 4.2105(b) and in the applicability instructions in interim FAR Case 2019-009, insert the following clause:

Prohibition on Contracting for Certain Telecommunications and Video Surveillance Services or Equipment (Aug 2020)

(a) *Definitions.* As used in this clause—

Backhaul means intermediate links between the core network, or backbone network, and the small subnetworks at the edge of the network (e.g., connecting cell phones/towers to the core telephone network). Backhaul can be wireless (e.g., microwave) or wired (e.g., fiber optic, coaxial cable, Ethernet).

Covered foreign country means The People's Republic of China.

Covered telecommunications equipment or services means–

(1) Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities);

(2) For the purpose of public safety, security of Government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities);

(3) Telecommunications or video surveillance services provided by such entities or using such equipment; or

(4) Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Critical technology means–

(1) Defense articles or defense services included on the United States Munitions List set forth in the International Traffic in Arms Regulations under subchapter M of chapter I of title 22, Code of Federal Regulations;

(2) Items included on the Commerce Control List set forth in Supplement No. 1 to part 774 of the Export Administration Regulations under subchapter C of chapter VII of title 15, Code of Federal Regulations, and controlled-

(i) Pursuant to multilateral regimes, including for reasons relating to national security, chemical and biological weapons proliferation, nuclear nonproliferation, or missile technology; or

(ii) For reasons relating to regional stability or surreptitious listening;

(3) Specially designed and prepared nuclear equipment, parts and components, materials, software, and technology covered by part 810 of title 10, Code of Federal Regulations (relating to assistance to foreign atomic energy activities);

(4) Nuclear facilities, equipment, and material covered by part 110 of title 10, Code of Federal Regulations (relating to export and import of nuclear equipment and material);

(5) Select agents and toxins covered by part 331 of title 7, Code of Federal Regulations, part 121 of title 9 of such Code, or part 73 of title 42 of such Code; or

(6) Emerging and foundational technologies controlled pursuant to section 1758 of the Export Control Reform Act of 2018 (50 U.S.C. 4817).

Interconnection arrangements means arrangements governing the physical connection of two or more networks to allow the use of another's network to hand off traffic where it is ultimately delivered (e.g., connection of a customer of telephone provider A to a customer of telephone company B) or sharing data and other information resources.

Reasonable inquiry means an inquiry designed to uncover any information in the entity's possession about the identity of the producer or provider of covered telecommunications equipment or services used by the entity that excludes the need to include an internal or third-party audit.

Roaming means cellular communications services (e.g., voice, video, data) received from a visited network when unable to connect to the facilities of the home network either because signal coverage is too weak or because traffic is too high.

Substantial or essential component means any component necessary for the proper function or performance of a piece of equipment, system, or service.

(b) Prohibition. (1) Section 889(a)(1)(A) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Pub. L. 115-232) prohibits the head of an executive agency on or after August 13, 2019, from procuring or obtaining, or extending or renewing a contract to procure or obtain, any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system. The Contractor is prohibited from providing to the Government any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system, unless an exception at paragraph (c) of this clause applies or the covered telecommunication equipment or services are covered by a waiver described in FAR 4.2104.

(2) Section 889(a)(1)(B) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (Pub. L. 115-232) prohibits the head of an executive agency on or after August 13, 2020, from entering into a contract, or extending or renewing a contract, with an entity that uses any equipment, system, or service that uses covered telecommunications equipment or services as a substantial or essential component of any system, or as critical technology as part of any system, unless an exception at paragraph (c) of this clause applies or the covered telecommunication equipment or services are covered by a waiver described in FAR 4.2104. This prohibition applies to the use of covered telecommunications equipment or services, regardless of whether that use is in performance of work under a Federal contract.

(c) *Exceptions.* This clause does not prohibit contractors from providing—

(1) A service that connects to the facilities of a third-party, such as backhaul, roaming, or interconnection arrangements; or

(2) Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

(d) Reporting requirement.

(1) In the event the Contractor identifies covered telecommunications equipment or services used as a substantial or essential component of any system, or as critical technology as part of any system, during contract performance, or the Contractor is notified of such by a subcontractor at any tier or by any other source, the Contractor shall report the information in paragraph (d)(2) of this clause to the Contracting Officer, unless elsewhere in this contract are established procedures for reporting the information; in the case of the Department of Defense, the Contractor shall report to the website at https://dibnet.dod.mil. For indefinite delivery contracts, the Contractor shall report to the Contracting Officer for the indefinite delivery contract and the Contracting Officer(s) for any affected order or, in the case of the Department of Defense, identify both the indefinite delivery contract and any affected orders in the report provided at https://dibnet.dod.mil.

(2) The Contractor shall report the following information pursuant to paragraph (d)(1) of this clause

(i) Within one business day from the date of such identification or notification: the contract number; the order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or recommended.

(ii) Within 10 business days of submitting the information in paragraph (d)(2)(i) of this clause: any further available information about mitigation actions undertaken or recommended. In addition, the Contractor shall describe the efforts it undertook to prevent use or submission of covered telecommunications equipment or services, and any additional efforts that will be incorporated to prevent future use or submission of covered telecommunications equipment or services.

(e) *Subcontracts.* The Contractor shall insert the substance of this clause, including this paragraph (e) and excluding paragraph (b)(2), in all subcontracts and other contractual instruments, including subcontracts for the acquisition of commercial items.

(End of clause)